

# EADS Astrium Presentation to the Review of U.S. Human Spaceflight Plans Committee



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All the space you need



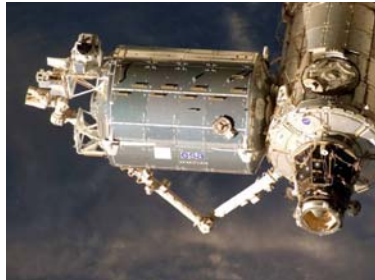
# Introduction

- EADS Astrium very much appreciates this opportunity to address the Committee on the Review of U.S. Human Spaceflight Plans.
- EADS Astrium, as prime contractor to ESA, has been actively cooperating with the U.S. for over 30 years and is committed to being a reliable partner to NASA and U.S. industry in the joint pursuit of U.S. & European human spaceflight and space exploration goals.
- EADS Astrium, as ESA's "Industrial Operator" for Europe's contribution to the ISS, is fully committed to enabling the extension of the ISS to its maximum useful lifetime to enable the partners to reap the benefits of their investments, and to exploit ISS capabilities in support of exploration beyond LEO.
- EADS Astrium, as a multi-national company, is engaged in international programs and believes that international cooperation can provide a stable and beneficial approach to space exploration for the U.S., Europe, and other potential partners.



# EADS Astrium – a Reliable International Partner

## Proven Assets & Capabilities



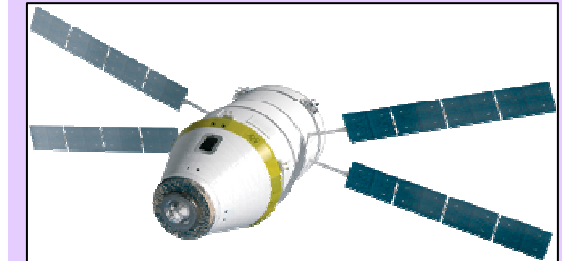
Columbus: Habitat/  
ECLSS/Payloads



Ariane 5: Launcher  
Production and Devt.



ATV: Automatic  
Rendezvous and Docking



ATV Evolution/ Advanced Re-entry  
Vehicle: Download/Upload, Crew  
Vehicle

## Human Spaceflight & Robotic Exploration



ISS/ Columbus:  
Industrialized Operations  
for System & Payloads /  
Utilization



ARD: Entry, Descent,  
Landing



Rosetta , Mars, Venus  
Express: Interplanetary  
Missions, Rovers



Soft and Precision Landing,  
Extended Surface Mobility, Rover

**EADS**  
astrium

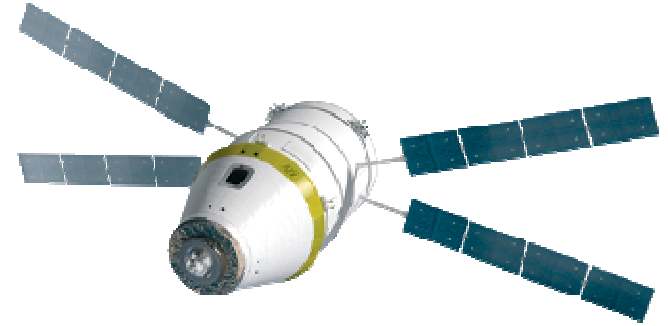
# Building on Successful Cooperation

## EADS Astrium, through ESA programs, is an experienced partner to NASA & U.S. industry since the 1970's:

- As prime contractor to ESA for the European **Spacelab**, which first flew in 1983 and continued with European & international participation in most of the 22 Spacelab missions up to the Neurolab mission in 1998; Hundreds of top-class research projects world-wide were made possible by these missions in the **Space Shuttle**.
- Strong and sustained cooperation within the **International Space Station** program: Prime contractor to ESA for the development and operation of the **Columbus Laboratory**, of which 50% of the available internal payload capacity is utilized by the U.S. and 50% by Europe.
- Europe's **Operational Automatic Transfer Vehicle (ATV)** supplies the International Space Station and contributes to ESA's portion of common space operation costs. The first flight of ATV-Jules Verne was performed successfully in 2008. Further ATVs are in production under contract to ESA.

# Reap the Benefits of the ISS Investment

## Safeguard ISS Operations Through Extended Use of European Logistics Elements

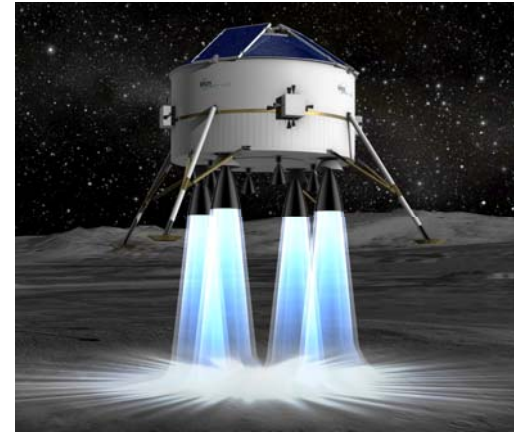


- **Robust logistics support for the ISS** through additional ATV missions: **EADS Astrium** can offer additional **ATV mission services**, with up to 7.7 t of mixed manifest cargo each, to supply ISS in cooperation with U.S. industry; our industrial experience would mitigate risks and reduce potential delays in the U.S.
- **Evolve the Automated Transfer Vehicle as a building block to support ISS Logistics and Future LEO infrastructure. Enhance ATV capabilities** e.g. Cargo Return from the ISS and ultimately as a crewed vehicle. Astrium is leading an ESA awarded study for a Cargo Return Vehicle based on an evolution of ATV (Advanced Re-entry Vehicle).
- **Increase utilization** onboard **Columbus** of **experiments** in support of U.S. & European Space Exploration goals and to further enable top class research aboard the ISS.
- **Fully Reap the benefits of ISS.** Contribute to the extension of the lifetime of the ISS to 2020 and beyond. Columbus, with a design lifetime of 15 years, is compatible with this goal.



# Leverage European Capabilities

## Enable a Robust & Vigorous International Space Exploration Program with European Contributions



- EADS Astrium is at the forefront of the development of exploration technologies including Soft and Precision landing. Such capabilities would enable Europe to **contribute to the U.S. space exploration goals** with, for example, an **automated lunar cargo logistic lander** (similar to the ATV for ISS).
- **EADS Astrium is the only European company** to have provided products successfully demonstrating automatic rendezvous capabilities.
- EADS Astrium could provide significant **key building blocks** in a joint international human and robotic **space exploration scenario** based on current assets and capabilities, with the aim of establishing an international robust and sustainable mission scenario.
- EADS Astrium's expertise, gained as the **Industrial Operator** for Europe's ISS activities through the industrialization of space segment & payload operations, could further enable international operational programs to achieve **reliable, yet cost-efficient, industrial services**.

# Conclusions

- **ATV:** EADS Astrium can offer additional ATV mission services to supply ISS in cooperation with U.S. industry.
- **Industrialization:** EADS Astrium's expertise gained as **Industrial Operator** for Europe's ISS activities could further enable international operational programs to achieve **reliable, yet cost-efficient, industrial services**.
- **Future Exploration Programs:** EADS Astrium could provide significant **key building blocks** in a joint **international** human and robotic **space exploration scenario**.



# Back-up Slides





# EADS Astrium – an Overview

EADS Astrium is a global space industry leader, with world-class expertise and extensive prime contractor experience across all sectors of the space business:

- Science, navigation & telecommunication satellites
- Services
- Launchers: Ariane, Soyuz, Rockot, Vega, future launchers
- Ballistic Missiles, Missile Defense
- Orbital Systems & Space Exploration: Columbus, ATV, ISS Exploitation (Operations & ATV production/services), (Re-)entry, Descent & Landing
- Propulsion & Equipment
- System Design, System Integration & Production



**As a reliable long term partner to NASA and U.S. industry, EADS Astrium can make a positive contribution to future U.S. human spaceflight goals.**

- EADS Astrium is the industrial prime contractor for continued development and production of the Ariane 5 launch vehicle, delivering the fully integrated Ariane 5 vehicle to Arianespace in Kourou, French Guyana;
- Delivery On Time, On Quality of seven Ariane 5 launchers per year;
- EADS Astrium is a major shareholder within Arianespace, Starsem and Eurockot Launch Services;
- Ariane 5 will be operated up to 2025 and beyond through an upgraded version known as A5-ME, providing increased payload performance and in-orbit re-ignition capability.



# Europe's Contribution to ISS

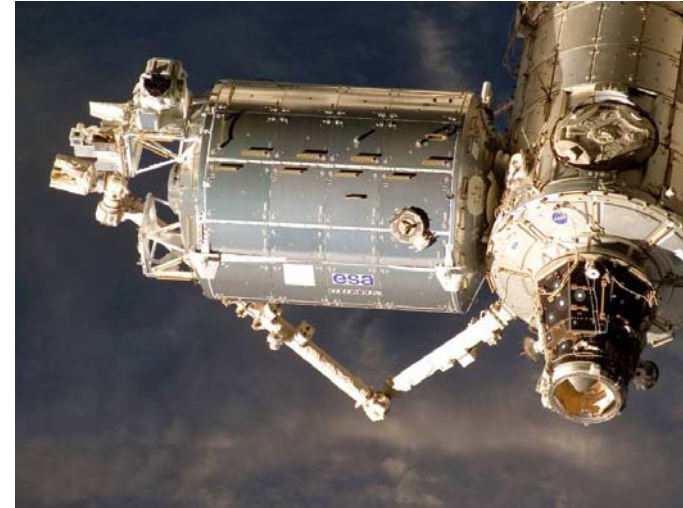
EADS Astrium is ESA's Prime Contractor for COLUMBUS & ATV:

## COLUMBUS

- 10 active high-tech payloads (5 European, 5 U.S.) can be operated by three astronauts in parallel:
  - Human physiology
  - Biology
  - Material science
  - Protein crystallization
  - Fluid science
  - Fundamental physics
- 4 external payloads in orbit

## ATV

- Autonomous and automated docking to ISS
- Supplies ISS with up to 7.7 tonnes mixed manifest cargo
- Performs re-boost of ISS and debris collision avoidance maneuvers
- Disposed of by controlled re-entry



**EADS Astrium is responsible for ATV production & provides mission services.**

# ISS Exploitation and Utilization

- Industrial Operator for the European contribution to the ISS
  - Mission planning & execution
  - Control centres Col-CC and ATV-CC
  - Maintenance, sustaining engineering,
  - Astronaut training
  - Provide mission services with ATV
  - Experiment facilities
- Utilization of the ISS: Experiment Facilities and Experiments for Microgravity Research and as a test bed for Space Exploration
- Provision of the Integrated Cargo Carrier (11 flights to date) for the Cargo Mission Contract (Shuttle/ ISS)

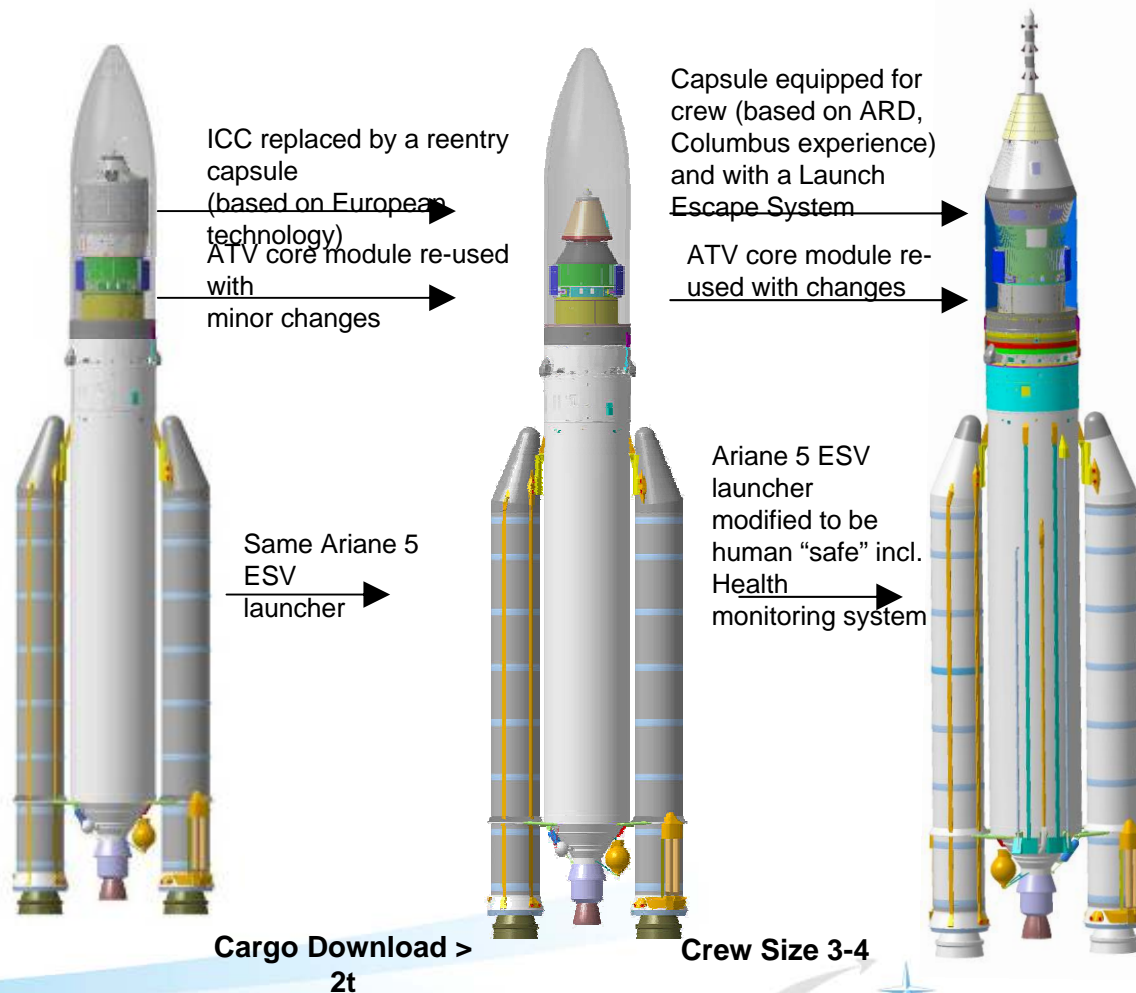




# Advanced Re-entry Vehicle (ARV)

EADS Astrium is leading an ESA study of the ARV, an evolution of the ATV to add download capability.

This will pave the way towards a full development program of a capability for up and download of cargo to the ISS and eventually towards a human capability.



## The European Leader in Space Exploration

- The only European company to have demonstrated **Re-entry Capabilities** with the Atmospheric Re-entry Demonstrator project (ARD)
- **EADS Astrium is the only European company** to have provided products successfully demonstrating automatic rendezvous capabilities
- EADS Astrium is leading an ESA study on **Soft and Precision Landing** on the moon, ultimately leading to a European cargo lander capability
- EADS Astrium is a major contributor to Exomars as prime for the **heat shield** and **landing platform** and for **the rover system**
- EADS Astrium was prime contractor for ESA's successful **Mars and Venus Express** interplanetary probes

